

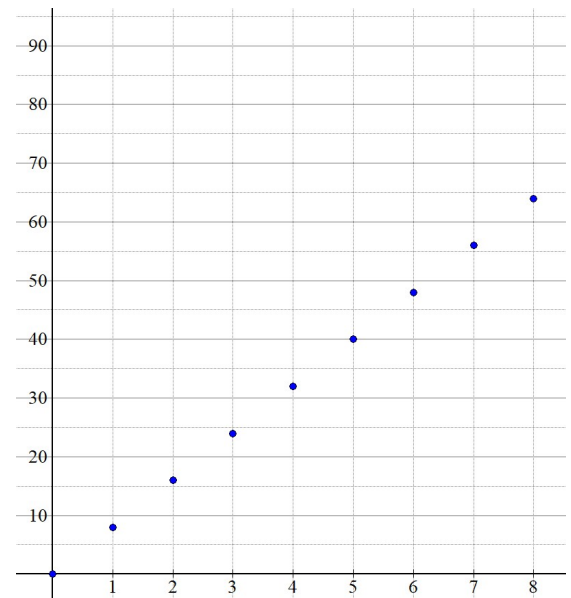
Lesson 2.2 Notes

1. The Library of Congress in Washington D.C. is considered the largest library in the world. They often receive boxes of books to be added to their collection. Since books can be quite heavy, they aren't shipped in big boxes. If, on average, each box contains about 8 books, how many books are received by the library in 6 boxes, 10 boxes, or n boxes?
 - a. Is this function discrete or continuous?
The function is discrete because the Library of Congress must receive whole numbers of boxes and whole numbers of books.
 - b. Identify the domain of the function.
It does not make sense to receive a negative number of boxes or a partial number of boxes. So, the domain is positive integers.
 - c. Use a table, a graph, and an equation to create a mathematical model for the number of books added at n boxes.

n	$f(n)$
0	0
1	8
2	16
3	24

Equation:

$$f(n) = 8n$$



**We do not connect the points on our graph because the function is discrete.

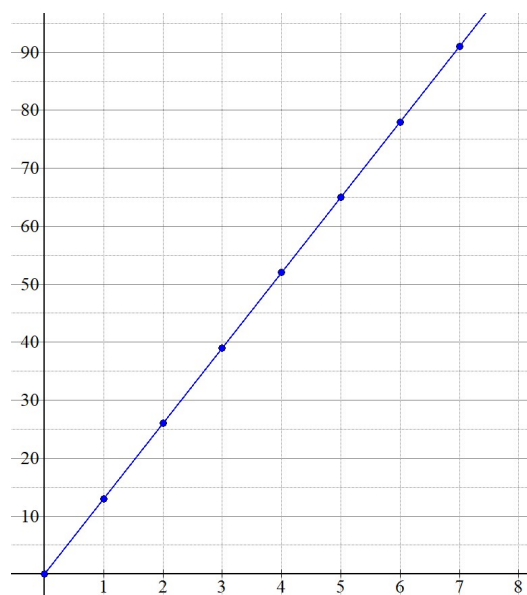
2. Many of the books at the Library of Congress are electronic. If about 13 e-books can be downloaded onto the computer each hour, how many e-books can be added to the library in 3 hours, 5 hours, or n hours (assuming that the computer memory is not limited)?
 - a. Is this function discrete or continuous?
The function is continuous because the number of books can be continuously changing assuming that a queue of books to be downloaded is kept full.
 - b. Identify the domain of the function.
It does not make sense to have downloaded a negative number of books. However, it does make sense that a partial number of books could be downloaded. So, the domain of the function is positive real numbers.

- c. Use a table, a graph, and an equation to create a mathematical model for the number of books added at n boxes.

n	$f(n)$
0	0
1	13
2	26
3	39

Equation:

$$f(n) = 13n$$

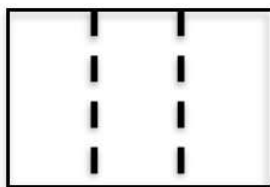


**We connect the points on the graph with a line because the function is continuous.

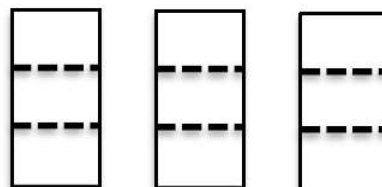
3. A giant piece of paper is cut into three equal pieces and then each of those is cut into three equal pieces and so forth. How many papers will there be after a round of 10 cuts? 20 cuts? n cuts?



Zero Cuts



One Cut



Two Cuts

- a. Is this function discrete or continuous?

The function is discrete because you aren't continuously changing the number of pieces of paper. When you finish each cut, you increase the number of pieces of paper.

- b. Identify the domain of the function.

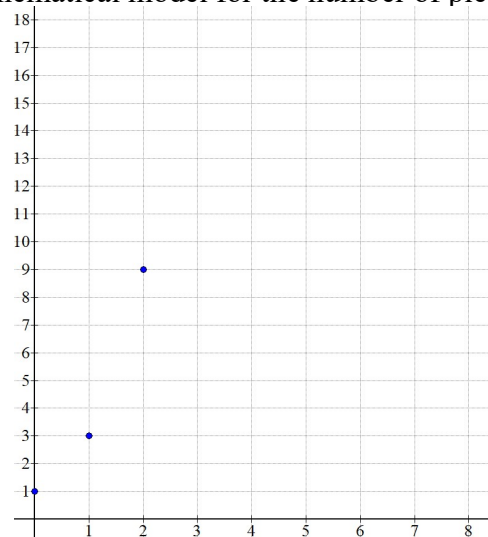
It does not make sense to have made a negative number of cuts. We could theoretically make a partial cut, but since a partial cut doesn't actually increase the number of pieces of paper, we will say that a partial cut does not make sense. Therefore, the domain is positive integers.

- c. Use a table, a graph, and an equation to create a mathematical model for the number of pieces of paper after n cuts.

n	$f(n)$
0	1
1	3
2	9
3	27

Equation:

$$f(n) = 3^n$$



4. Medicine taken by a patient breaks down in the patient's blood stream and dissipates out of the patient's system. Suppose a dose of 60 milligrams of anti-parasite medicine is given to a dog and the medicine breaks down such that 20% of the medicine becomes ineffective every hour. How much of the 60 milligram dose is still active in the dog's bloodstream after 3 hours, after 4.25 hours, after n hours?

- a. Is this function discrete or continuous?

Since the medicine is continuously breaking down in the dog's bloodstream, the function is continuous.

- b. Identify the domain of the function.

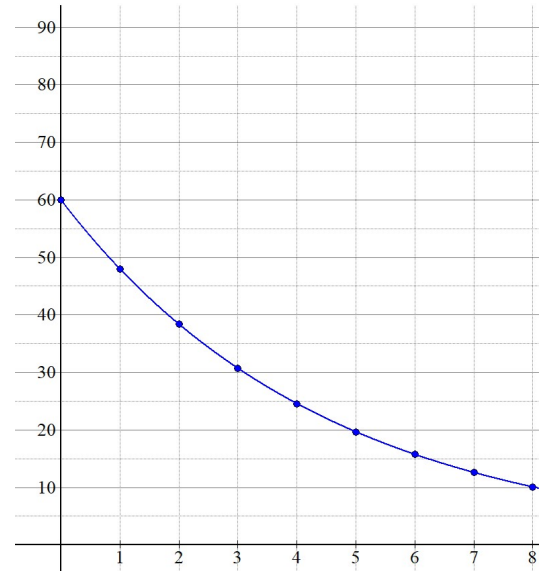
The dog receives the dose of medicine at time zero, so negative numbers of hours does not make sense. However, we could find the amount of active medicine at partial amounts of hours. So, the domain is positive real numbers.

- c. Use a table, a graph, and an equation to create a mathematical model for amount of active medicine after n hours.

n	$f(n)$
0	60
1	48
2	38.4
3	30.72

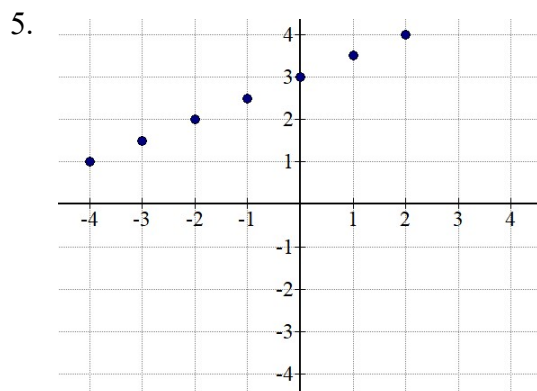
Equation:

$$f(n) = 0.8^n \cdot 60$$



**We connect the points on the graph with a line because the function is continuous.

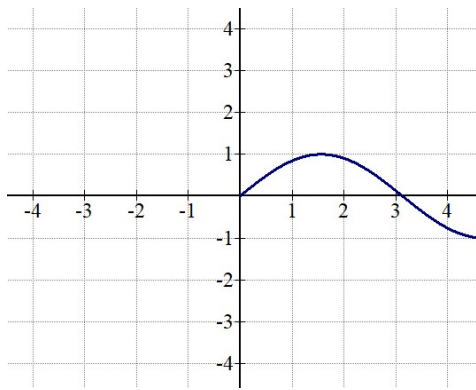
Find the domain of each.



Because the domain (x-values) is represented as only the points that are integer points, but both positive and negative integers are represented, the domain is "Integers."

- i. Real Numbers
- ii. Positive Real Numbers
- iii. Integers
- iv. Positive Integers

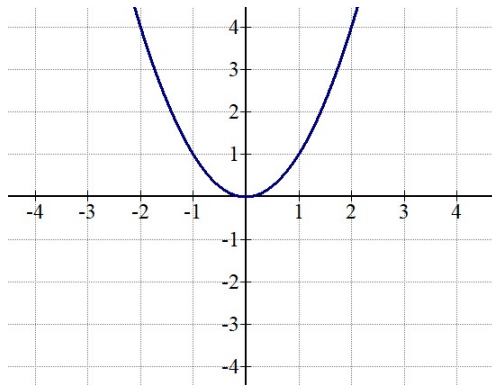
6.



Because the domain (x-values) is represented as all points to the right of zero, the domain is “Positive Real Numbers.”

- i. Real Numbers
- ii. Positive Real Numbers
- iii. Integers
- iv. Positive Integers

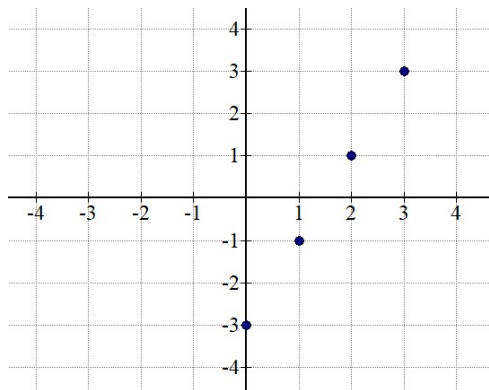
7.



Because the domain (x-values) is represented as all points both to the left and to the right of zero, the domain is “Real Numbers.”

- i. Real Numbers
- ii. Positive Real Numbers
- iii. Integers
- iv. Positive Integers

8.



Because the domain (x-values) is represented as only the points that are integer points and only positive integers are represented, the domain is “Positive Integers.”

- i. Real Numbers
- ii. Positive Real Numbers
- iii. Integers
- iv. Positive Integers

Find the slope of each.

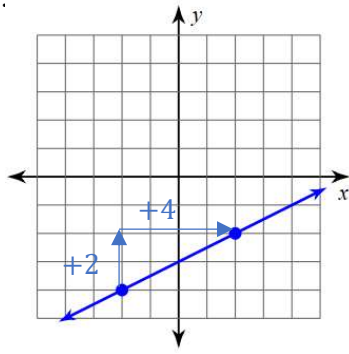
9. $6x + y = 3$

$$-6x \quad -6x$$

$$y = -6x + 3$$

We know that this equation is in $y = mx + b$ form and m is the slope. So, the slope is -6 .

10.



$$\frac{\Delta y}{\Delta x} = \frac{2}{4} = \frac{1}{2}$$

11. .

	x	y	
-2	-18	-10	-6
-2	-20	-16	-6
-2	-22	-22	

$$\frac{\Delta y}{\Delta x} = \frac{-6}{-2} = 3$$

12. $x + 3y = 6$

$$\begin{aligned} -x & \quad -x \\ 3y &= -x + 6 \\ \frac{3y}{3} &= \frac{-x}{3} + \frac{6}{3} \\ y &= -\frac{1}{3}x + 2 \end{aligned}$$

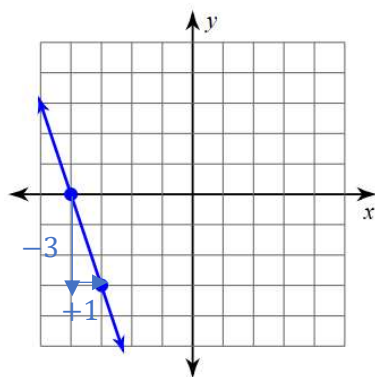
We know that this equation is in $y = mx + b$ form and m is the slope. So, the slope is $-\frac{1}{3}$.

13. .

	x	y	
-13	-3	-9	+15
-13	-16	6	+15
	-29	21	

$$\frac{\Delta y}{\Delta x} = \frac{15}{-13} = -\frac{15}{13}$$

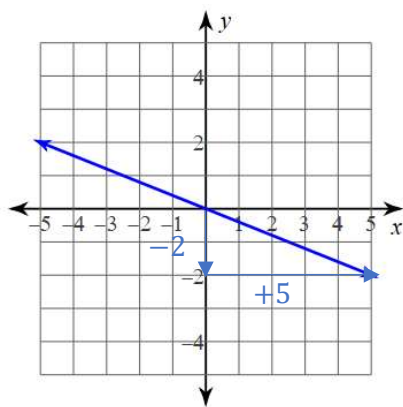
14.



$$\frac{\Delta y}{\Delta x} = \frac{-3}{1} = -3$$

Write the equation of the line in slope-intercept ($y = mx + b$) form.

15.

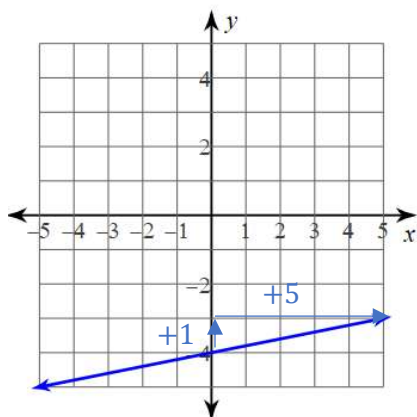


$$\frac{\Delta y}{\Delta x} = \frac{-2}{5} = -\frac{2}{5}$$

The y-intercept is where the line crosses the y-axis (in this case at 0).

$$y = -\frac{2}{5}x \quad \text{**We don't write +0 for the y-intercept.}$$

16.

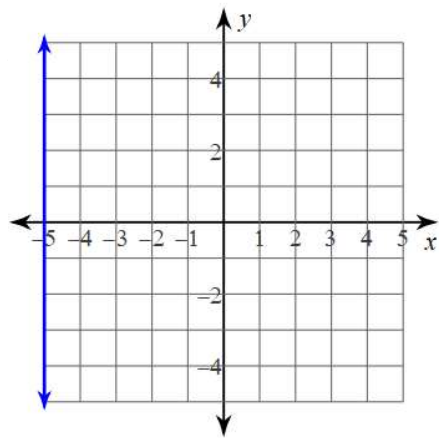


$$\frac{\Delta y}{\Delta x} = \frac{1}{5}$$

The y-intercept is where the line crosses the y-axis (in this case at -4).

$$y = \frac{1}{5}x - 4$$

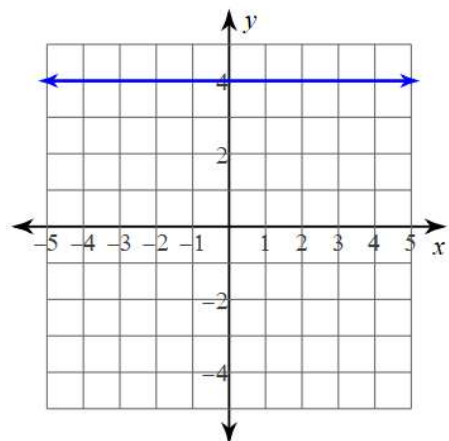
17.



Vertical lines are always of the format “x=”

$$x = -5$$

18.



Horizontal lines are always of the format “y=”

$$y = 4$$